VCU Mercury Study

Part 1: Fish consumption by recreational anglers in Virginia's freshwater tidal rivers

Virginia Mercury Symposium

November 28 - 29, 2007

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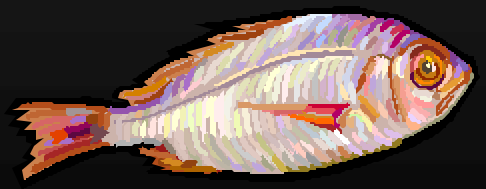
Overview

1) Research problem
2) Research objectives
3) Research design and methods
4) Angler survey results
5) Expected outcomes

This project was sponsored by a grant from the Virginia Department of Environmental Quality

Background

- Exposure to methylmercury (MeHg) can result in adverse health effects – the most sensitive target organ is the developing brain
- Primary source of MeHg exposure in the US is through the consumption of fish



Standards to protect the public from exposure to mercury

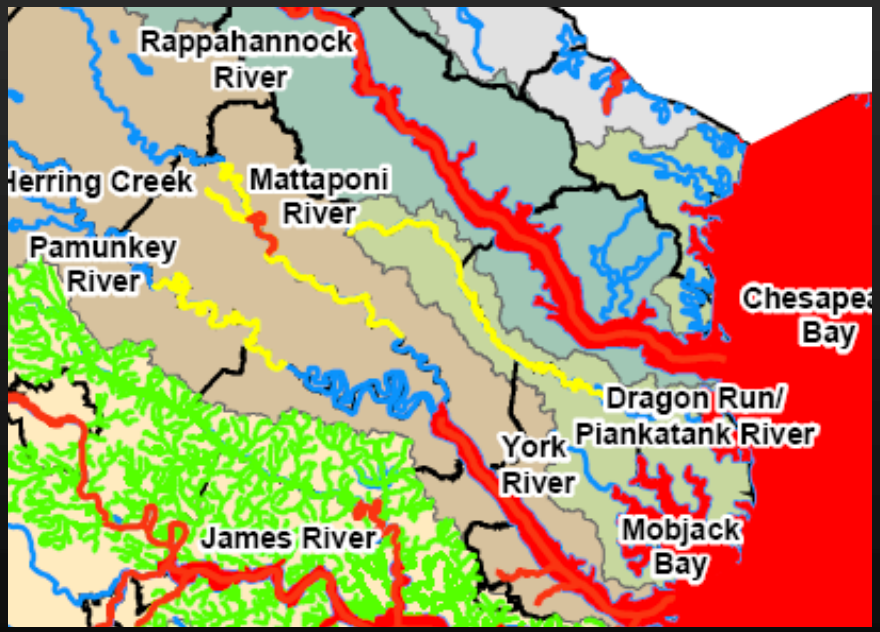
- The Food and Drug Administration (FDA) has set an action level of 1 part of MeHg in a million parts (ppm) of seafood.

- The Virginia Department of Health (VDH) guideline for issuing a fish consumption advisory for mercury is 0.5 ppm.

(from the VDH website “Frequently Asked Questions about Mercury”)

In Virginia

Many of the lakes, reservoirs, and slow moving (swampy) rivers have advisories on eating one or more species of fishes



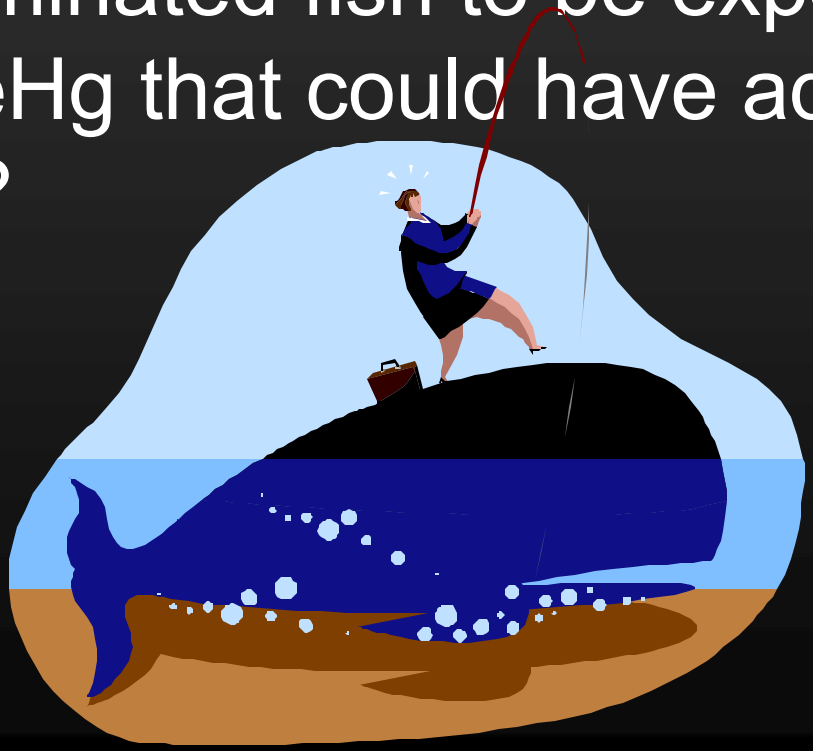
Red = PCB, Yellow = Mercury, Green = Kepone

- *Motts Run Reservoir* *
- *Chandler's Mill Pond* *
- Dragon Run Swamp
- Gordonsville Lake
- Mattaponi River
- Herring Creek
- Pamunkey River
- Harrison Lake
- Chickahominy Lake
- Blackwater River
- Great Dismal Swamp Canal
- *Nottoway River* *
- *Roanoke (Staunton) River* *
- *Kerr Reservoir* *

** New mercury advisory as of 8/31/07*

Research Question

- Are Virginia's freshwater anglers (and members of their households) eating enough contaminated fish to be exposed to levels of MeHg that could have adverse health effects?



Objectives

- Obtain Virginia specific fish consumption data and compare/contrast with federal estimates

- Estimate the risk to recreational freshwater anglers (and members of their households) from the consumption of fishes contaminated with MeHg caught in Virginia's freshwater tidal rivers

Research Plan

- Data needed:
  - Virginia specific fish consumption data
    - Types of fishes eaten (both self-caught and purchased)
    - Amount and frequency of consumption
  - Fish tissue mercury levels
    - For commercially caught species
    - For fishes caught in Virginia's rivers

DEQ → MeHg levels in VA freshwater fish

MeHg levels in commercially caught fish ← FDA, NMFS

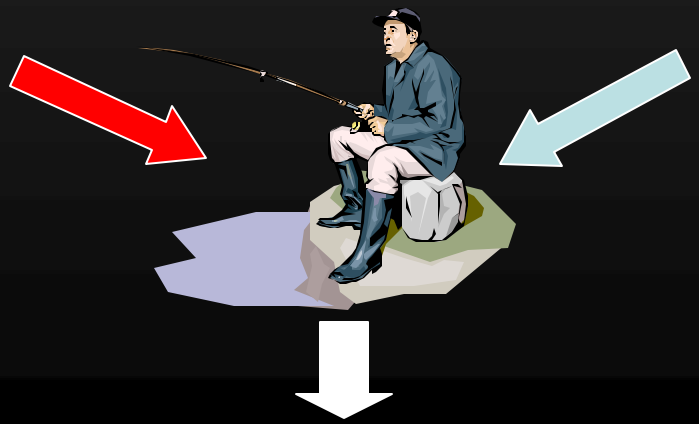
link to website

survey → species consumed

types of purchased fish in VA

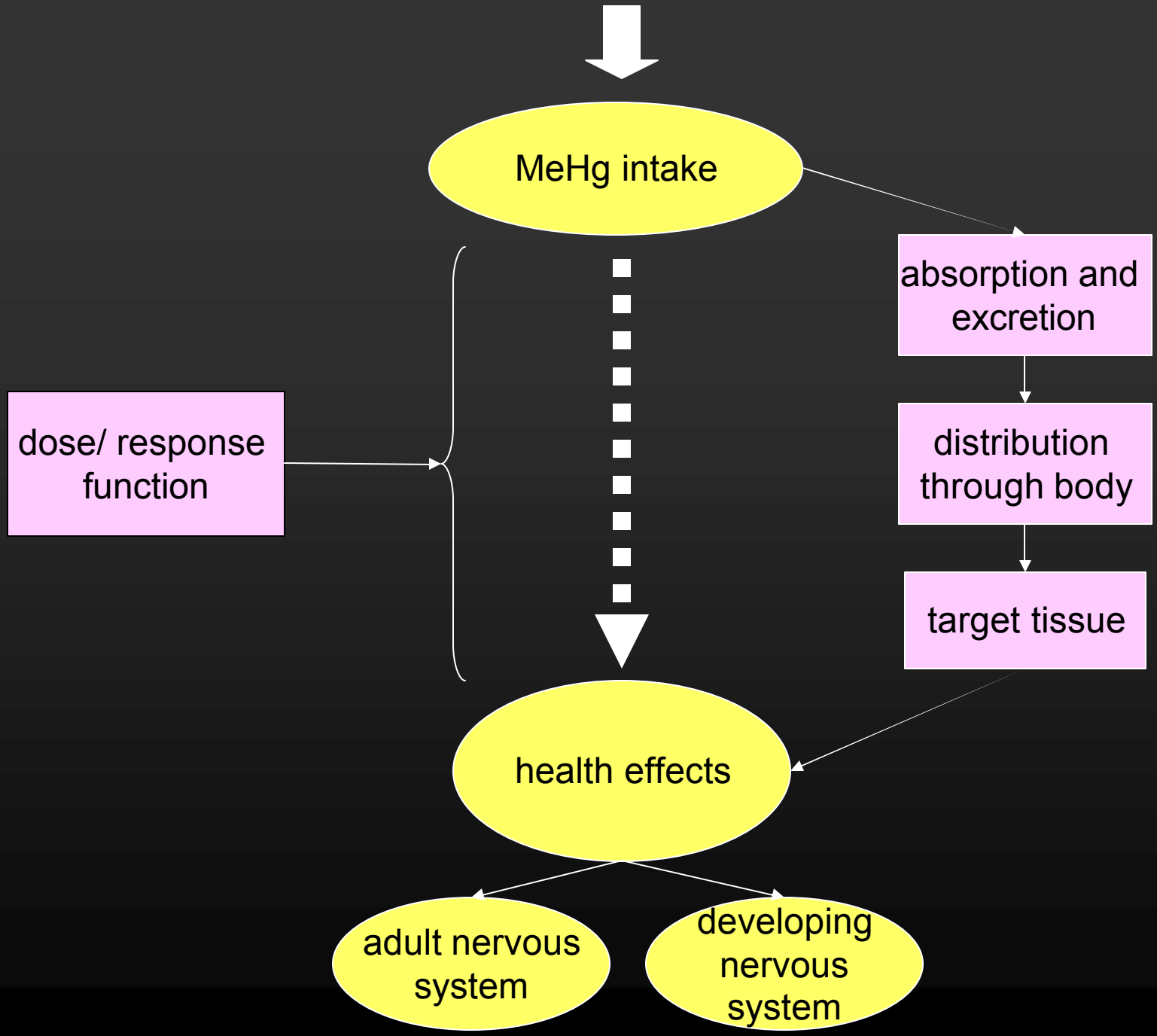
survey → consumption rate

consumption rate ← survey



Research Plan (cont.)

- Data needed:
  - Human health effects of methylmercury and dose/ response function (from toxicological literature):
    - ATSDR. Toxicological Profile of Mercury. 1999. Atlanta, GA: Agency for Toxic Substances and Disease Registry. Available: http://www.atsdr.cdc.gov/toxprofiles/tp46.html [accessed 10 Oct 2006].
    - Davidson PW, Myers GJ, Cox C, Wilding GE, Shamlaye CF, Huang LS, Cernichiari E, Sloane-Reeves J, Palumbo D, Clarkson TW. 2006. Methylmercury and neurodevelopment: Longitudinal analysis of the Seychelles child development cohort. Neurotoxicology and Teratology 28(5):529-35.
    - Debes F, Budtz-Jørgensen E, Weihe P, White RF, Grandjean P. 2006. Impact of prenatal methylmercury exposure on neurobehavioral function at age 14 years. Neurotoxicology and Teratology 28(5):536-47.
    - EPA. 1997b. Mercury Study Report for Congress. Volume V: Health Effects of Mercury and Mercury Compounds. EPA-452/R-97-007. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards and Office of Research and Development.
    - NRC (Committee on the Toxicological Effects of Methylmercury, National Research Council). 2000. Toxicological Effects of Methylmercury. Washington, DC: National Academy Press.


MeHg intake
absorption and excretion
distribution through body
target tissue
dose/ response function
health effects
adult nervous system
developing nervous system

Research Plan Summary

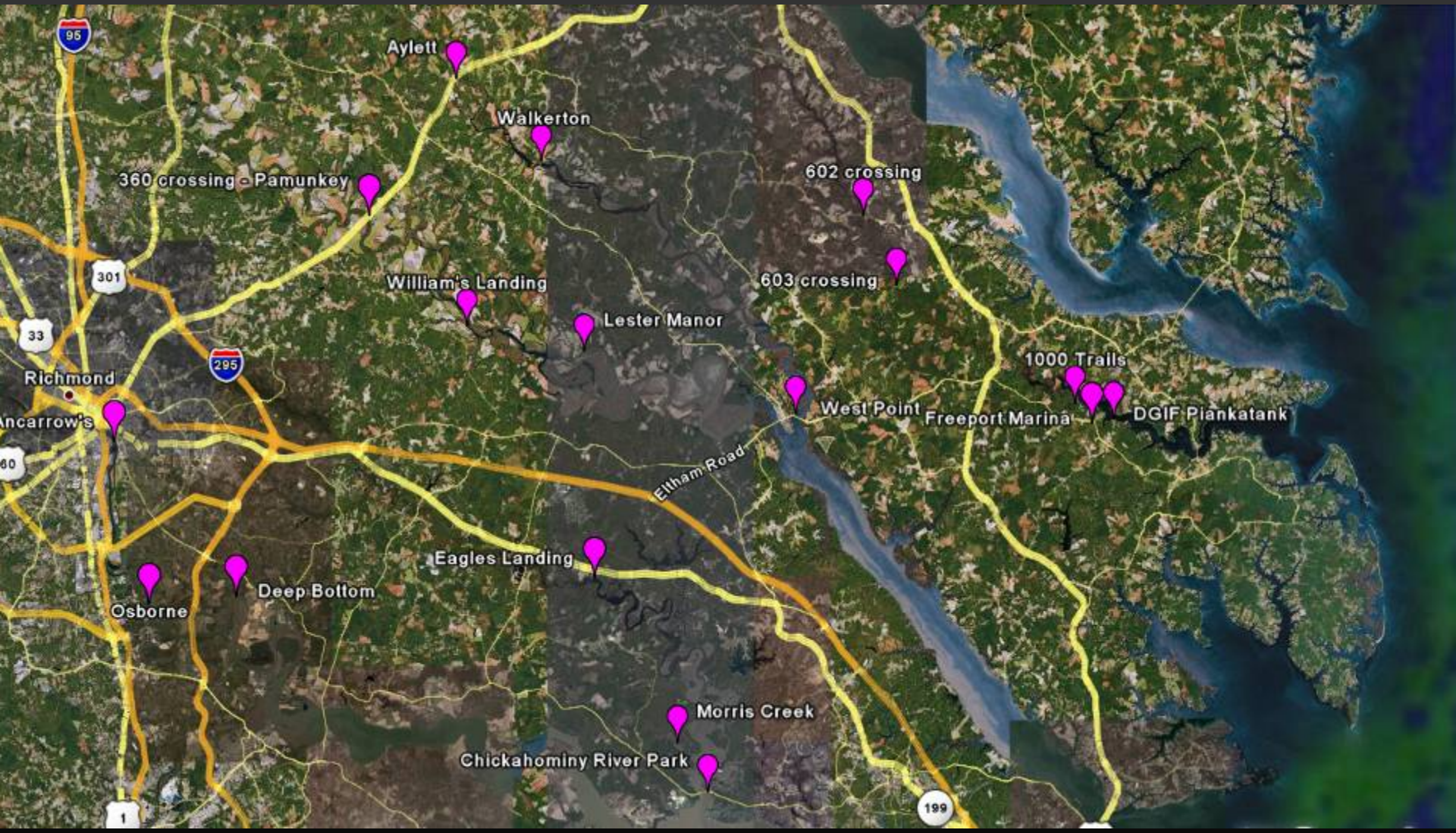
- Collect new data on the fish consumption habits of recreational anglers
- Use existing fish tissue data from DEQ, NMFS, and FDA
- Use existing information on the health effects of MeHg from published medical and toxicological studies

Research Design and Methods

Methods – fish consumption survey

- Intercept survey
  - Personal interviews with anglers at boat ramps, piers, and along the shore

Survey Sites:



Survey Sites

James River

Chickahominy

Also:

- Eagles Landing (Chickahominy Lake)
- Chickahominy River Park

Morris Creek (Chickahominy Wildlife Management Area)

Mattaponi River
- Aylett
- Walkerton
- West Point

Pamunkey River
- under 360 bridge
- Williams Landing
- Lester Manor

Dragon Run/ Piankatank
- under Rt. 602 bridge (Dragon Run)
- under Rt. 603 bridge (Dragon Run)
- 1000 Trails campground (Piankatank River)
- DGIF boat launch at 606 Landing (Piankatank River)

Survey

- Fishing behavior
- Fish consumption behavior
- Household makeup
- Demographic information

Survey for James River

Surveyor Name:	**SURVEY NUMBER:**
Survey Location:	Time Begin:
Date:	Time End:
Day of Week:	Length of Interview:
Gender: ☐Male ☐Female	Fishing Mode? ☐Shore ☐Pier ☐Boat

My name is _____ *(first name).* **I'm with the VCU fishing survey team. We're talking to people who fish here to learn how Virginia's rivers are used for fishing. Can I have about 10 minutes of your time to ask you some questions? All of your answers will be confidential and anonymous.**

Thank you! Before we start, I just want to make sure that you haven't already been interviewed by our team sometime this summer. Have you been interviewed by one of us before?
IF YES, TERMINATE INTERVIEW. IF NO, CONTINUE

FOR ALL QUESTIONS: UNLESS OTHERWISE NOTED, READ RESPONSE OPTIONS ONLY IF RESPONDENT HAS TROUBLE ANSWERING.

1. How many miles did you travel to get here today?

_____ miles

2a. During this season or last season, have you fished on… *(read locations)*

Harrison Lake ☐Yes ☐No
the Chickahominy ☐Yes ☐No
the Pamunkey River ☐Yes ☐No
the Mattaponi River ☐Yes ☐No
the Dragon Run ☐Yes ☐No
Blackwater River ☐Yes ☐No

b. Where else in Virginia have you fished this season or last season?

_____

3. How often do you fish on the James River?

_____ times per ☐week ☐month ☐year

4. Think back to the first time you fished on the James River. Can you tell me how many years you have fished on the James River?

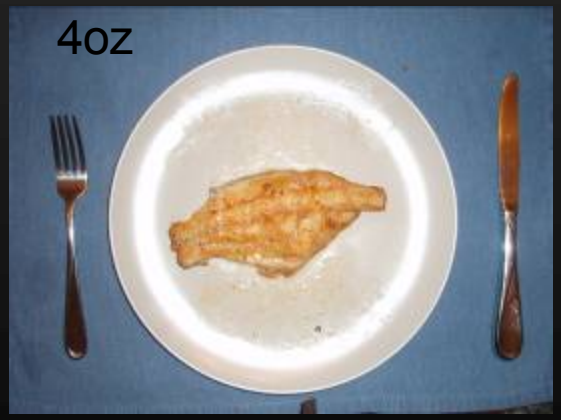
_____ ☐months ☐years

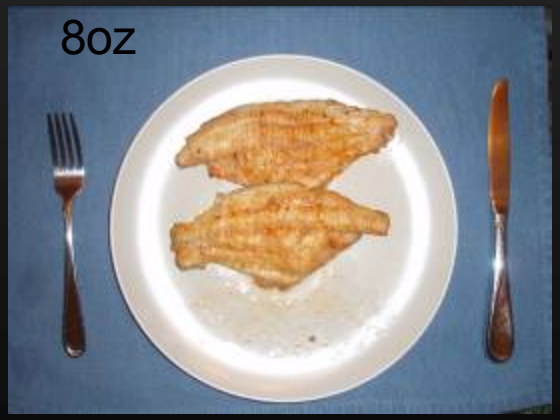
Data gathered from survey:

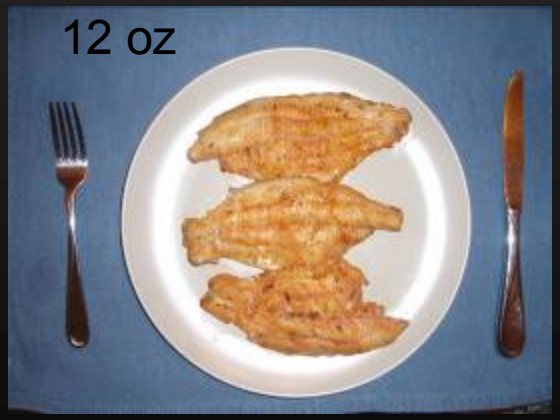
- Fishing behavior information:
  - frequency of recreational freshwater fishing
  - average distance traveled to fishing locations
  - range of fishing locations
  - duration of fishing at that location
- Do the anglers consume any of the fish they catch in the river in question? What is the frequency?
- Is the primary purpose for fishing there to get food to eat?

- The species of fish caught on the river in question that are most frequently consumed (up to four)
  - the average meal size
  - the frequency, and the months that fish is most frequently consumed

Portion size visual aid

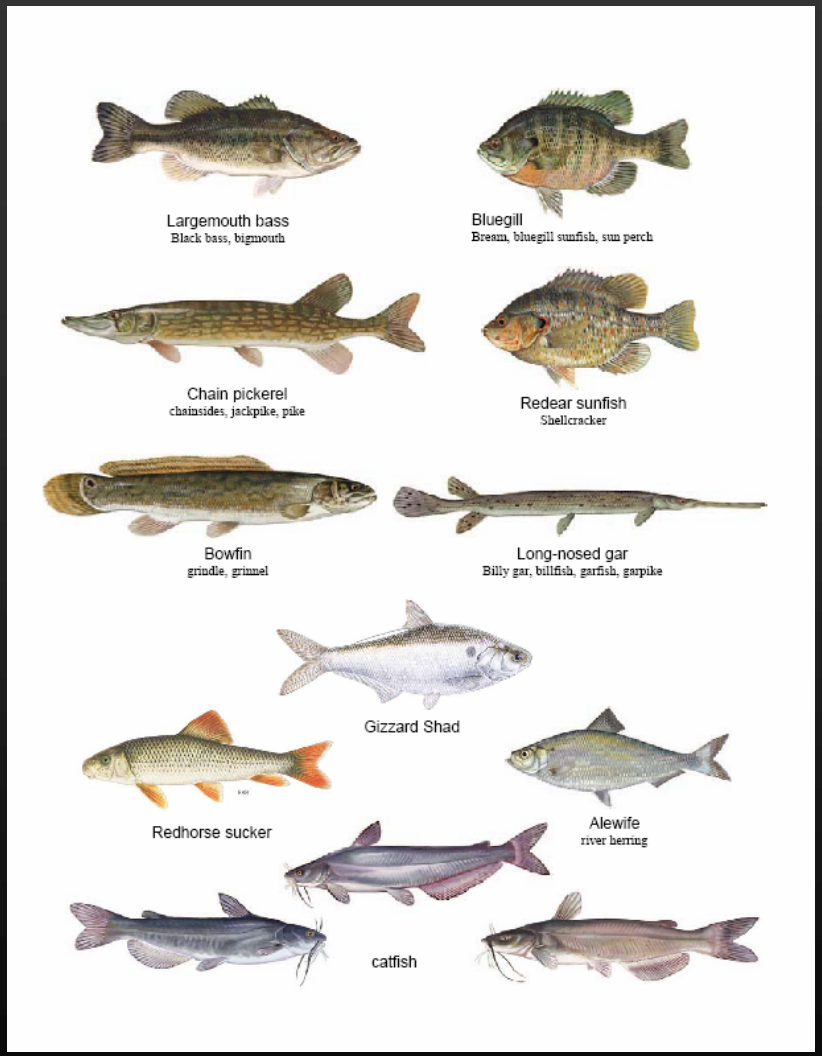






- Are there any fish that anglers won't eat?
- Household make-up and number of people in each category that consume recreationally caught fish:
  - children under 5
  - children 6 – 15
  - adults 50 or older
  - men 16-49
  - women 16-49
  - women who have been pregnant in the last year

Fish species visual aid



- Do the anglers give away any of the fish that they catch from the river in question?
- The frequency of consumption and average meal size of store bought fish meals consumed by anglers (including canned tuna)

- Do the anglers know about the fish advisory?
  - how did they know of the advisory?
  - do they understand the advisory?

Survey Questions

- demographic information:
  - zip code
  - age
  - race
  - education level
  - income level

pier at West Point

156 surveys completed:

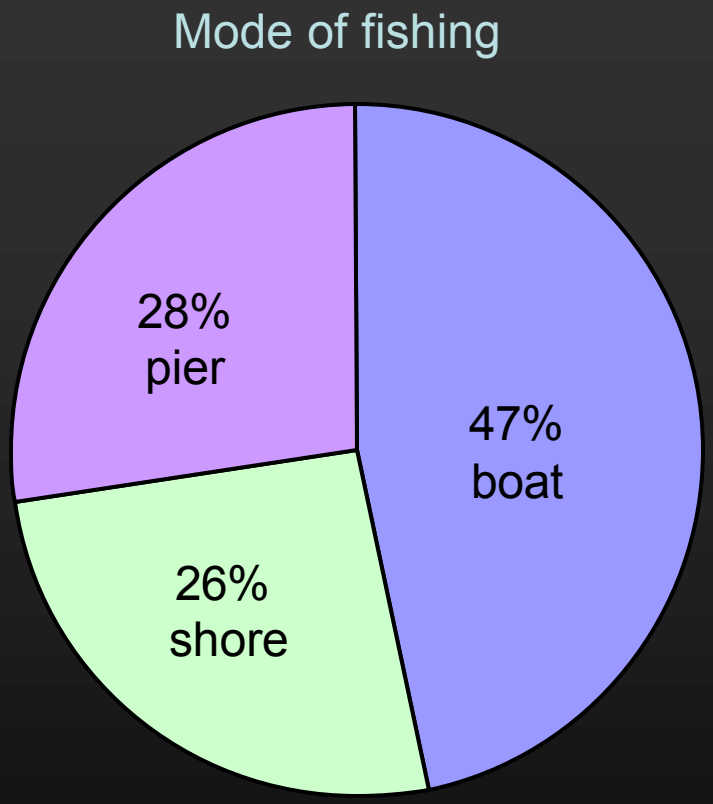
Count of surveys	day							
survey location	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	**Grand Total**
Ancarrow's				9	6	4	5	**24**
Osborne	5		4	3	8	4		**24**
Deep Bottom	4	2	1			4		**11**
Eagle's Landing	2							**2**
Chick WMA	2						2	**4**
Chickahominy River Park	3	4		3		3		**13**
Aylett	3		1		2		7	**13**
Walkerton	1	2	1				5	**9**
West Point	2		7				8	**17**
360 Bridge - Pamunkey							2	**2**
Williams Landing	7		2				7	**16**
Lester Manor			1					**1**
602 bridge	2							**2**
603 bridge	1							**1**
1000 Trails				1			2	**3**
Freeport Landing		1					2	**3**
rt. 606 Piankatank	7			1			3	**11**
Grand Total	**39**	**9**	**17**	**17**	**16**	**15**	**43**	**156**

Survey Statistics

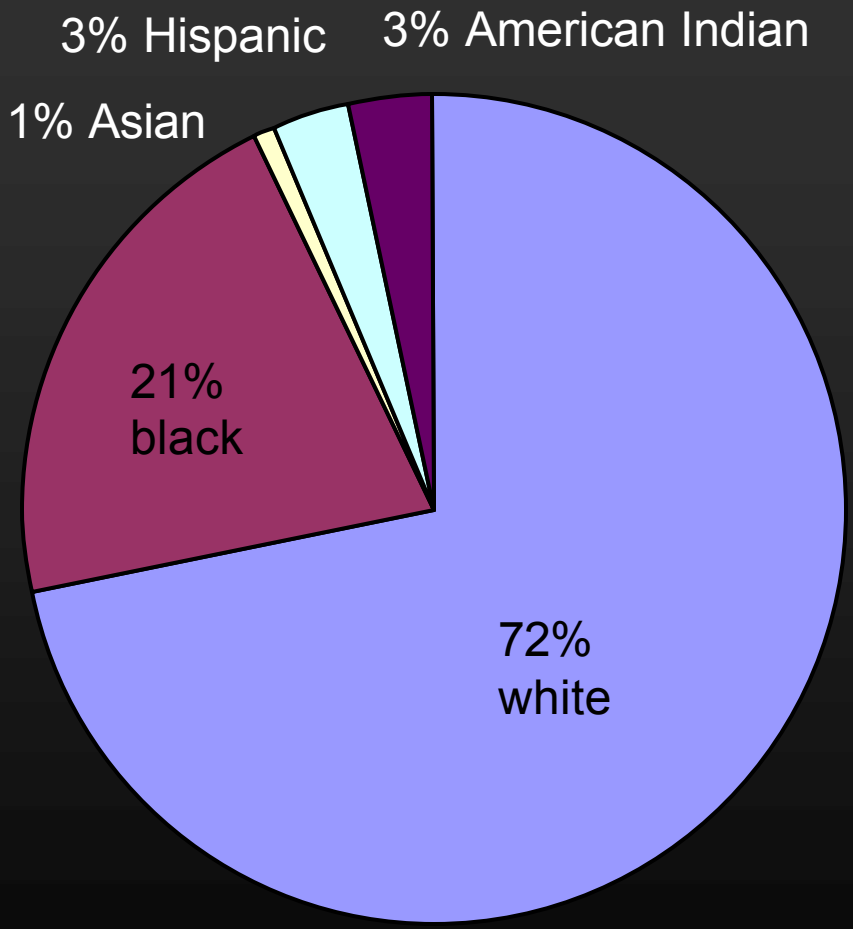
Walkerton

Survey Statistics

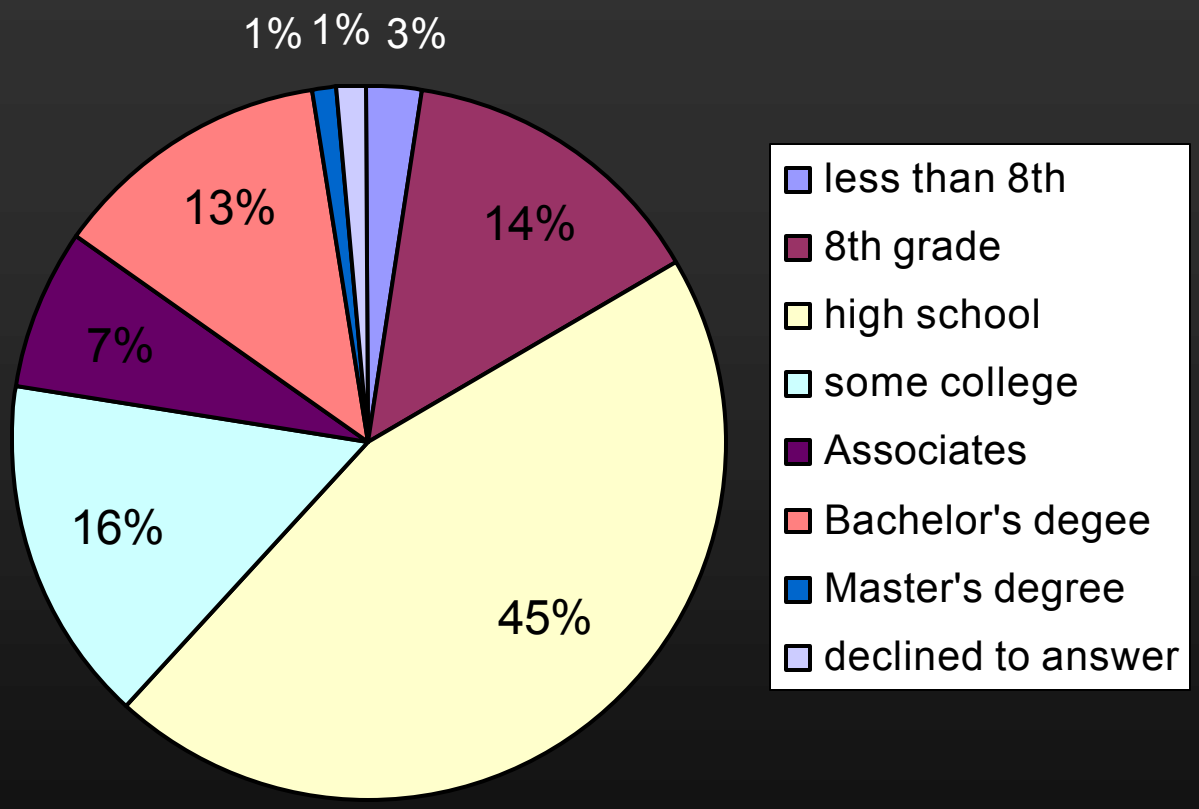
- Response rate: 85% completion
- 90% were men; 10% were women
- 51% eat the fish they catch; 49% do not eat the fish they catch



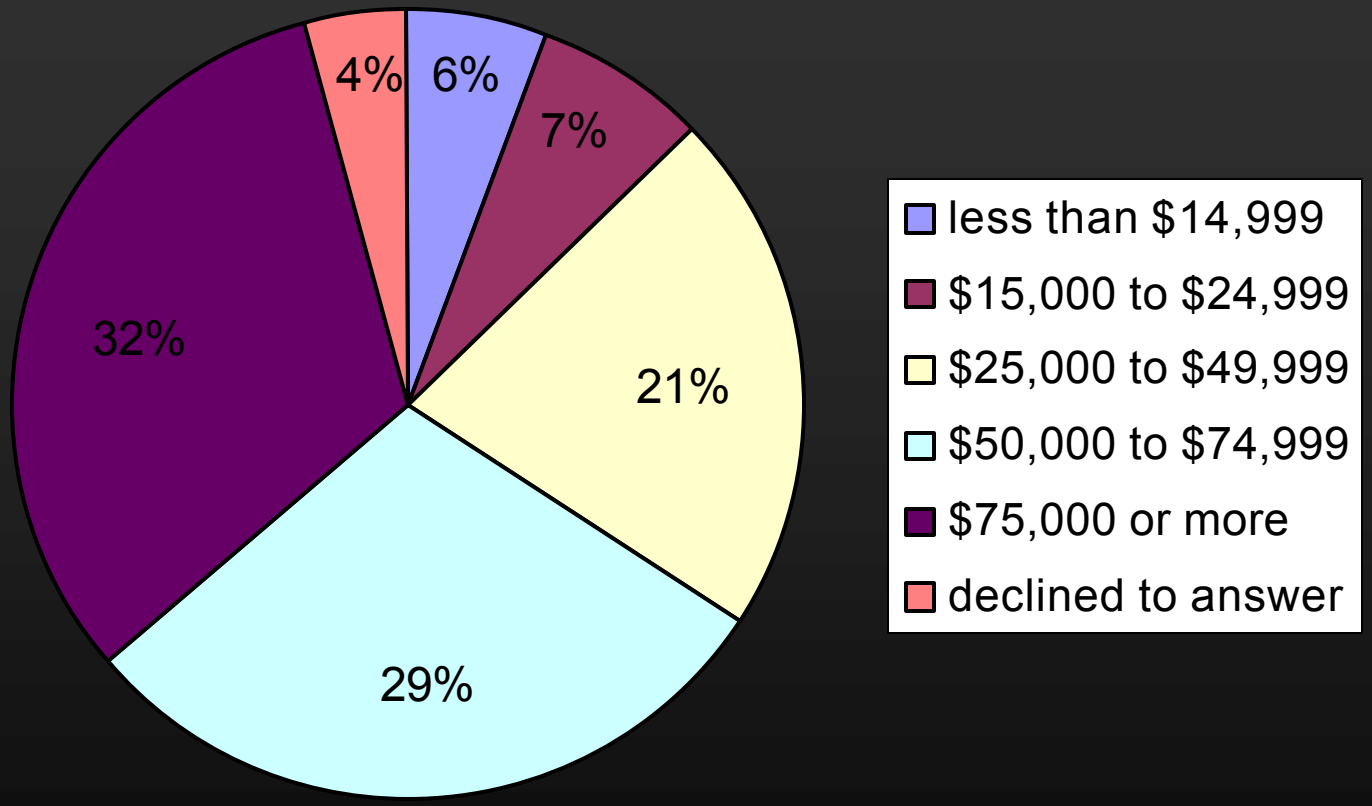
Self-described race/ ethnicity



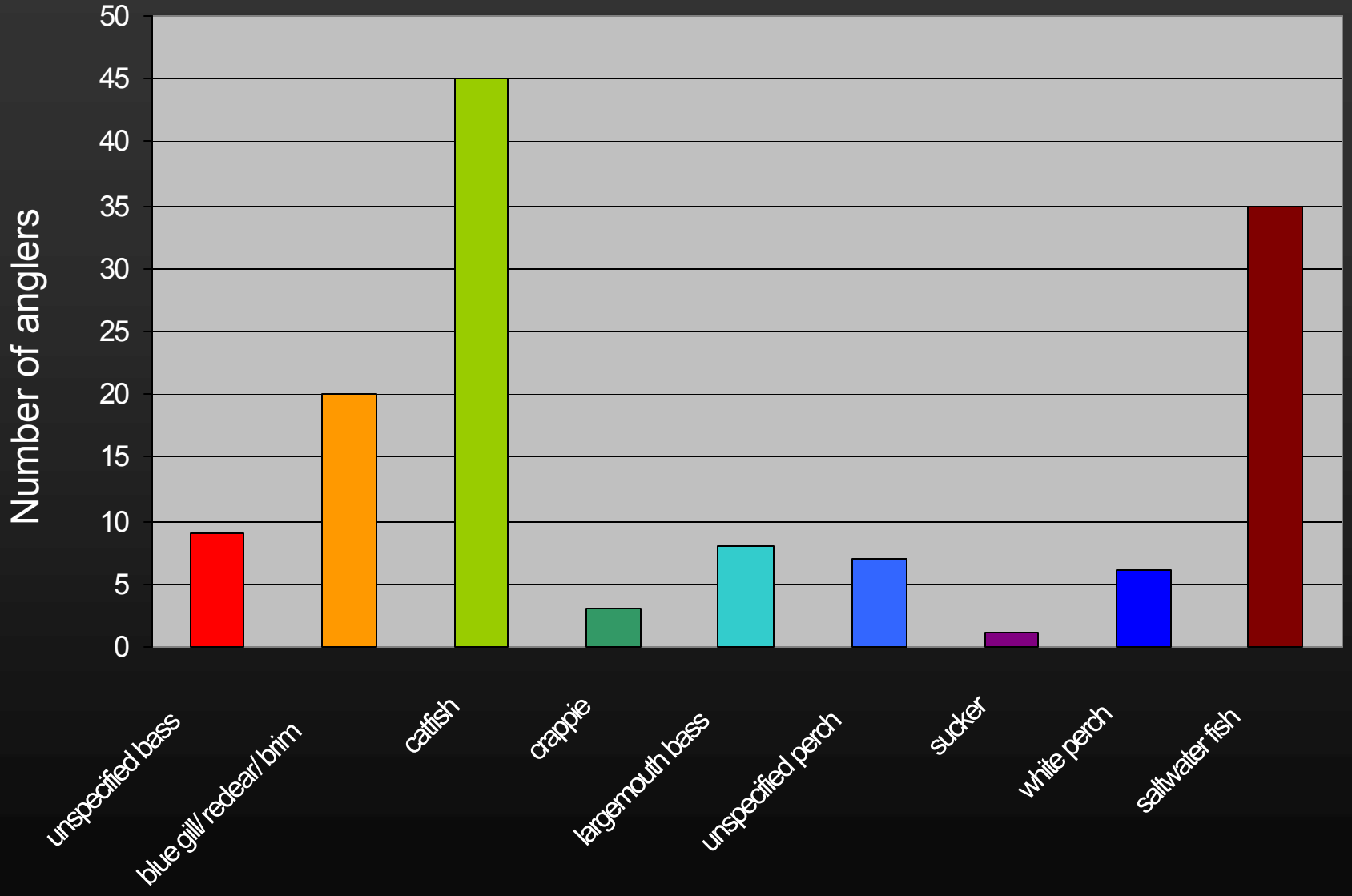
Education level



Household income level



Types of fish consumed

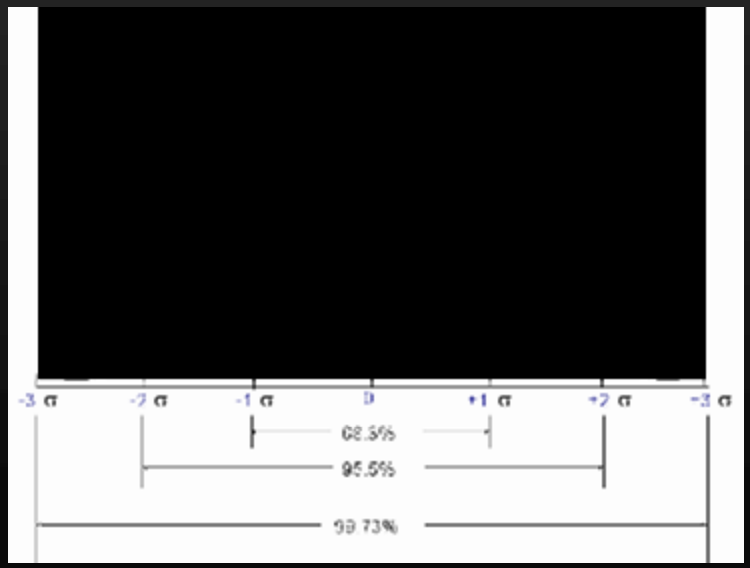


Data Analysis Plan

- Data will be exported from Access to Excel and SAS to get descriptive statistics
- Probabilities of risk will be generated by running models in Crystal Ball

Expected Outcomes

- Virginia specific fish consumption information
- Probability distributions of amount of fish eaten, fish consumption, amount of MeHg in fish tissue, and adverse health effects
- Risk assessment of the consumption of MeHg contaminated fish from Virginia's freshwater tidal rivers



Questions?

602 bridge – Dragon Run